

Course: Discipline Specific Core

Semester	5
Paper Number	HMBCR5112T /P
Paper Title	Industrial Microbiology
No. of Credits	6 (Th:4, Pr:2)
Theory/Composite	Composite
No. of periods assigned	Th: 4 Pr: 3
Course description/objective	<ol style="list-style-type: none"> 1. Knowledge of microbial strain for industrial processes. 2. To understand the different types of bioreactors and downstream process for purification of products.
Reading/Reference Lists	<ol style="list-style-type: none"> 1. Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited 2. Okafor N. (2007). Modern Industrial Microbiology and Biotechnology. 1st edition. Bios Scientific Publishers Limited. USA 3. Waites M.J., Morgan N.L., Rockey J.S. and Higton G. (2001). Industrial Microbiology: An Introduction. 1st edition. Wiley – Blackwell 4. Glaze A.N. and Nikaido H. (1995). Microbial Biotechnology: Fundamentals of Applied Microbiology. 1st edition. W.H. Freeman and Company 5. Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited. 6. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi. 7. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.
Evaluation	<p>CIA: 20 End-Sem: 80 (Th:50 and Pr:30)</p> <p>Question paper format of Th paper (Mod 1: 30 Mod 2: 20 Marks) Module 1 with 30 marks: Objective questions 6 marks (6 questions out of 8) 3 questions of 8 marks each (3 questions out of 4)</p> <p>Module 2 with 20 marks: Objective questions 4 marks (4 questions out of 6) 2 questions of 8 marks each (2 questions out of 3)</p>

C-11: INDUSTRIAL MICROBIOLOGY (THEORY)
SEMESTER –V

HMBCR5112T

TOTAL HOURS: 52

CREDITS: 4

Module 1

Marks 30

Unit 1 Introduction to industrial microbiology

No. of Hours: 5

Brief history and developments in industrial microbiology

Unit 2 Isolation of industrially important microbial strains and fermentation media

No. of Hours: 10

Sources of industrially important microbes and methods for their isolation, preservation and maintenance of industrial strains, strain improvement, Crude and synthetic media; molasses, cornsteep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates

Unit 3 Types of fermentation processes, bio-reactors and measurement of fermentation parameters

No. of Hours: 10

Types of fermentation processes - Solid-state and liquid-state (stationary and submerged) fermentations; batch, fed-batch (eg. baker's yeast) and continuous fermentations

Components of a typical bio-reactor, Types of bioreactors-Laboratory, pilot- scale and production

fermenters, constantly stirred tank and air-lift fermenters, Measurement and control of fermentation

parameters - pH, temperature, dissolved oxygen, foaming and aeration

Unit 4 Down-stream processing

No. of Hours: 5

Cell disruption, filtration, centrifugation, solvent extraction, precipitation, lyophilization and spray

drying

Module 2

Marks 20

Unit 5 Microbial production of industrial products (micro-organisms involved, media, fermentation conditions, downstream processing and uses)

No. of Hours: 14

Citric acid, ethanol, penicillin, glutamic acid, Vitamin B12, streptomycin

Enzymes (amylase, protease, lipase), lysine

Wine, beer

Unit 6 Enzyme immobilization**No. of Hours: 8**

Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase)

C-11: INDUSTRIAL MICROBIOLOGY**(PRACTICAL)****HMBCR5112P****TOTAL HOURS: 39****CREDITS: 2**

1. Study different parts of fermenter
2. Microbial fermentations for the production and estimation (qualitative and quantitative) of:
(a) Enzymes: Amylase and Protease (b) Amino acid: Glutamic acid (c) Organic acid: Citric acid
(d) Alcohol: Ethanol
3. A visit to any educational institute/industry to see an industrial fermenter, and other downstream processing operations.